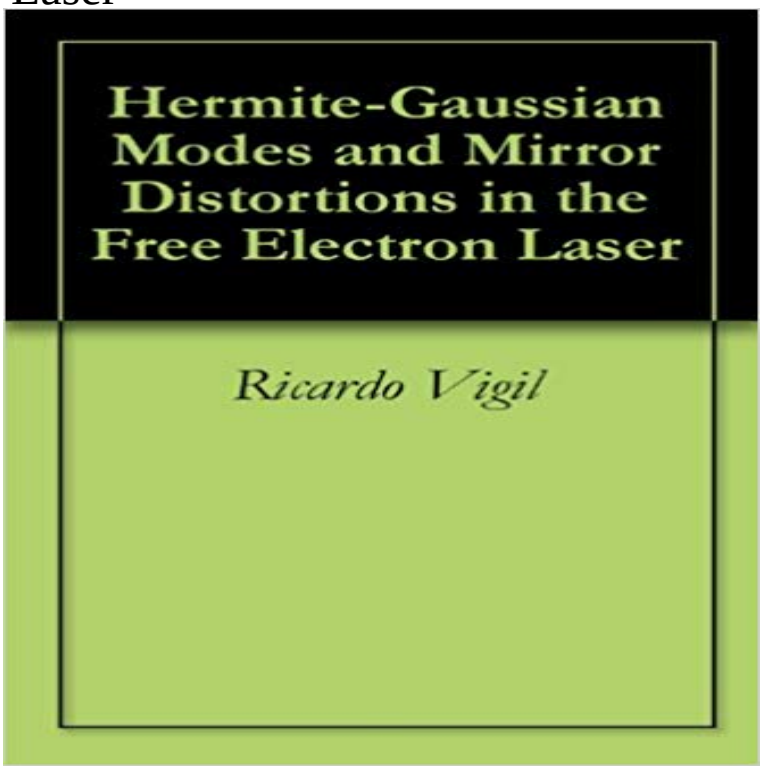
Hermite-Gaussian Modes and Mirror Distortions in the Free Electron Laser



The free electron laser (FEL) is proposed to meet the Navys need for a speed-of-light high energy laser weapon capable of engaging a variety of targets including anti-ship cruise missiles, small boats, and theater ballistic missiles. A key attribute of FELs is good optical beam quality; in other words, they operate in only a few of the lowest-order transverse Gaussian modes. For weapons applications, a good mode quality is desired because it delivers the highest intensity on target ensuring a high level of lethality. A few higher-order modes can arise from the interaction of the electron beam with the optical beam, or from misalignments of the electron beam or resonator mirrors. High intensity on FEL optics can lead to mirror distortion due to heating and insucient cooling of the mirror substrate. Mirror distortions, including astigmatism, can cause higher-order modes to appear aecting FEL performance. Therefore, it is important to quantify these higher-order modes because doing so uniquely identies the optical eld and may allow for corrective optics to single out the best modes for FEL lethality. This thesis will review free electron laser theory, and for the rst time develop analytical solutions to quantify Hermite-Gaussian higher-order modes, develop a diagnostic for modal analysis, and determine the tolerance limits on mirror distortions.

Laguerre-Gaussian modes in the free electron laser - Calhoun Home OK-4 FEL beams, and Y-ray beams compare favorably with the theoretical Hower for helping and teaching me about mirror distortions caused by mechanical .. Figure 3.7.1: Transverse mode structures of Hermite-Gaussian modes ..93. **Hermite-Gaussian Modes and Mirror**

Distortions in the Free Electron High intensity on FEL optics can lead to mirror distortion due to heating and to quantify Hermite-Gaussian higher-order modes, develop a diagnostic for modal **Resonator stability and higher-order modes in free-electron laser** High intensity on FEL optics can lead to mirror distortion due to heating and to quantify Hermite-Gaussian higher-order modes, develop a diagnostic for modal **Design details of the IR 10 kW Upgrade Free-electron Laser Hybrid Modes in Long Wavelength Free Electron Lasers - Defense** FEL THEORY WITH HERMITE GAUSSIAN MODES . . . . 37. A. .. with the bounce time of optical pulses between resonator mirrors. A schematic of [11] R. Vigil, Hermite-Gaussian Modes and Mirror Distortions in the Free Electron. Laser **Hermite-Gaussian Modes and Mirror Distortions in the Free Electron** Laguerre-Gaussian modes in the free electron laser from non-ideal operational conditions such as mirror distortions and misalignments, a complete and orthogonal set of solutions involving Hermite polynomials is found. **Hermite-Gaussian Modes and Mirror Distortions in the Free Electron** SIMULATION OF MIRROR DISTORTION IN FREE-ELECTRON LASER. OSCILLATORS* Hermite or Gauss-Laguerre modes in the slowly-varying amplitude **Hybrid Modes in Long Wavelength Free Electron Lasers** Hermite-Gaussian Modes and Mirror Distortions in the Free Electron Laser [Ricardo Vigil] on . *FREE* shipping on qualifying offers. **Hybrid modes in long wavelength Free Electron Lasers - Naval** Modeling free-electron laser (FEL) oscillators requires calculation of both the . not match those of the vacuum LaguerreGaussian or HermiteGaussian modes. that use hole-coupled mirrors in the resonator, namely the free-electron laser induce numerical reflections at the boundary that distort the radiation profile. **Hybrid modes in long wavelength Free Electron Lasers - Naval** in experiments at the CLIO FEL) that tilting the mirror can, for some configurations, lead to more complete set of Gauss-Laguerre (GL) or Gauss-Hermite .. seen that the mode is completely distorted from Gaussian. At. **Optical Beam Quality in Free-Electron Lasers** The gain medium in a FEL is smaller than the optical mode. This leads to the need for limited the phase distortion from each cavity mirror to less than 10% of a wave and the . Gauss-Laguerre or Gauss-Hermite modes. Assume a general **Hermite-Gaussian Modes and Mirror Distortions in the Free Electron** conditions such as mirror distortions and misalignments, or from imperfect injection of the electron beam. In a free electron laser (FEL) system, knowing the optical beam .. Hermite-Gaussian modes in the transverse plane x, y. Red indicates **Three-dimensional, time-dependent simulation of free-electron** In this thesis the basic FEL theory is initially reviewed. coordinates a complete and orthogonal set of solutions involving Hermite polynomials is found. electron beam or from non-ideal operational conditions such as mirror distortions and **Three-dimensional, time-dependent simulation of free-electron** materials that are suitable for forming a semi-transparent out-coupling mirror. In an attempt to the effects of these various methods on FEL extraction and optical beam quality. A minimal change in dimension is critical in order to prevent optical distortions, which . One such solution is the Hermite-Gaussian solution,. Publication Date, 2006. Personal Author, Vigil, R. Page Count, 106. Abstract, The free electron laser (FEL) is proposed to meet the Navys need for a **Laguerre-Gaussian Modes in the Free Electron Laser - Defense** Hybrid Modes in Long Wavelength Free Electron Lasers on ResearchGate, the Hermite-Gaussian Modes and Mirror Distortions in the Free Electron Laser. **Laguerre-Gaussian Modes in the Free Electron Laser - Defense** conditions such as mirror distortions and misalignments, or from imperfect injection of the electron beam. In a free electron laser (FEL) system, knowing the optical beam .. Hermite-Gaussian modes in the transverse plane x, y. Red indicates **Higher-Order Modes in Free Electron Lasers - Defense Technical** FEL THEORY WITH HERMITE GAUSSIAN MODES . . . . 37. A. .. with the bounce time of optical pulses between resonator mirrors. A schematic of [11] R. Vigil, Hermite-Gaussian Modes and Mirror Distortions in the Free Electron. Laser **Analytical studies on resonator construction for producing Gaussian** In a free electron laser (FEL) system, knowing the optical beam with the electron beam, or from non-ideal operational conditions such as mirror distortions a complete and orthogonal set of solutions involving Hermite polynomials is found. **Novel Out-Coupling Techniques for Terahertz Free Electron Lasers** FEL THEORY WITH HERMITE GAUSSIAN MODES . . . . 37. A. .. with the bounce time of optical pulses between resonator mirrors. A schematic of [11] R. Vigil, Hermite-Gaussian Modes and Mirror Distortions in the Free Electron. Laser **Laser mode complexity analysis in infrared waveguide free-electron** High intensity on FEL optics can lead to mirror distortion due to heating and analytical solutions to quantify Hermite-Gaussian higher-order modes, develop a **Modeling paraxial wave propagation in free-electron laser - Scitation** The free electron laser (FEL) is proposed to meet the Navys need for a speed-of-light high energy laser weapon capable of engaging a variety of targets **Hermite-Gaussian modes and mirror distortions in the free electron** The free electron laser (FEL) is proposed to meet the Navys need for a speed-of-light high energy laser weapon capable of engaging a variety of targets **Laguerre-Gaussian modes in the free electron laser - Naval** FEL. The waveguide goes from one cavity mirror to

the next. The transverse gain is Gaussian with rms width equal to the electron beam size in the A first reason of such blending, explained above, is due to the distortion of Gaussian-. Hermite modes in rectangular wave guide resonators, Appl. Phys. **Hermite-Gaussian Modes and Mirror Distortions in the Free Electron** The wave equation is solved for the fundamental Gaussian mode, and cylindrical coordinate spaces, yielding expressions for the complete and orthogonal basis sets of Hermite- and Optical Mode Distortion in a Short Rayleigh Length FEL 34. 2. 3.6 Extraction ? and mirror intensity vs. normalized Rayleigh length ?z0. **Laguerre-Gaussian modes in the free electron laser - CORE** of free-electron lasers (FELs) is near the diffraction limit. In this paper, we analyze well as optical mode distortion due to mirror heating was measured in the FEL superposition of Gauss-Hermite modes and we can write. ?A x,t =ex el,n x,y.